

Claims

- [c1]
 - 1. A method of heat treating a turbine rotor disk to obtain different radial properties at different locations in the rotor disk comprising:
 - a) heating the rotor disk for a period of from 4 to 10 hours at a temperature of 1800°F;
 - b) cooling the rotor disk to a temperature of about 1550°F;
 - c) holding the rotor disk at about 1550°F for a period of from about 2 to about 4 hours;
 - d) cooling the rotor disk to room temperature;
 - e) precipitation aging the rotor disk by heating the rotor disk to temperature of 1325°F for 8 hours, and
 - f) cooling the rotor disk.
- [c2] 2. The method of claim 1 wherein step a) is carried out for 4 hours.
- [c3] 3. The method of claim 1 wherein step b) is carried out by cooling the disk at a rate of from 1° to 5°F/min.
- [c4] 4. The method of claim 1 wherein step c) is carried out for 2 hours.

- [c5] 5. The method of claim 1 wherein step d) is carried out by cooling the rotor disk at a rate of 20°–40°F/min.
- [c6] 6. The method of claim 5 wherein step d) is carried out by cooling the rotor disk at a rate of about 25°F/min.
- [c7] 7. The method of claim 1 wherein step f) is carried out by furnace cooling the rotor disk at a rate of 100°F/hour to 1150°F, holding it at 1150°F for 8 hours and then air cooling the rotor disk to room temperature.
- [c8] 8. The method of claim 3 wherein step f) is carried out by furnace cooling the rotor disk at a rate of 100°F/hour to 1150°F, holding it at 1150°F for 8 hours and then air cooling the rotor disk to room temperature.
- [c9] 9. The method of claim 8 wherein step c) is carried out for 2 hours.
- [c10] 10. A method of heat treating a turbine rotor disk to obtain different radial properties at different locations in the rotor disk comprising:
 - a) heating the rotor disk for a period of from 4 to 10 hours at a temperature of 1800°F;
 - b) cooling the rotor disk to a temperature of about 1550°F;
 - c) holding the rotor disk at about 1550°F for a period of from about 2 to about 4 hours;

d) cooling the rotor disk to room temperature;
e) precipitation aging the rotor disk by heating the rotor disk to temperature of 1325°F for 8 hours, and
f) cooling the rotor disk;
wherein step d) is carried out by cooling the rotor disk at a rate of 20°–40°F/min; and
wherein step f) is carried out by furnace cooling the rotor disk at a rate of 100°F/hour to 1150°F, holding it at 1150°F for 8 hours and then air cooling the rotor disk to room temperature.

- [c11] 11. The method of claim 10 wherein step b) is carried out by cooling the disk at a rate of from 1° to 5°F/min.
- [c12] 12. The method of claim 10 wherein step a) is carried out for 4 hours.
- [c13] 13. The method of claim 10 wherein step c) is carried out for 2 hours.
- [c14] 14. The method of claim 10 wherein step d) is carried out by cooling the rotor disk at a rate of about 25°F/min.
- [c15] 15. The method of claim 12 wherein step c) is carried out for 2 hours.
- [c16] 16. A method of heat treating a turbine rotor disk to obtain different radial properties at different locations in

the rotor disk comprising:

- a) heating the rotor disk for a period of 4 hours at a temperature of 1800°F;
- b) cooling the rotor disk to a temperature of about 1550°F;
- c) holding the rotor disk at about 1550°F for a period of about 2 hours;
- d) cooling the rotor disk to room temperature at a rate of 20°–40°F/min;
- e) precipitation aging the rotor disk by heating the rotor disk to temperature of 1325°F for 8 hours, and
- f) furnace cooling the rotor disk at a rate if 100°F/hour to 1150°, holding it at 1150°F for 8 hours and then air cooling the rotor disk to room temperature.

[c17] 17. A turbine rotor disk heat treated according to the process of claim 1.

[c18] 18. A turbine rotor disk heat treated according to the process of claim 10.

[c19] 19. A turbine rotor disk heat treated according to the process of claim 16.